The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Official Action dated January 24, 2006. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

Claims 1-21 are under consideration in this application. Claims 1, 2, 6, 8, 15-16 and 21 are being amended, as set forth in the above marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim applicants' invention.

The claims and the specification are being amended to correct formal errors and/or to better recite or describe the features of the present invention as claimed. All the amendments to the claims are supported by the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Formality Rejection

Claim 2 was objected to for a minor formal error, and the Examiner has requested correction thereof. Claims 1-21 and claims 8-14 were rejected on separate grounds under 35 U.S.C. §101 due to the claimed invention being directed to non-statutory subject matter, as outlined on page 3 of the Office Action.

Regarding the claim objection, claim 2 is being amended as suggested by the Examiner.

Regarding the 101 rejection against claims 1-21, the last step of each independent claims is being amended to better recite "determining, at each of the secondary storage subsystems, which remote copy requests to process based on the first time parameter, primary storage IDs and timestamps associated with the remote copy requests, thereby maintain data I/O consistency among said storage subsystems" for a practical application of the invention for maintaining data I/O consistency among multiple storage subsystems (N:M). Applicants contend that the above recitation more clearly sets forth subject matter of the invention that "*is concrete, tangible and useful. See AT&T, 172 F.3d at 1358, 50 USPQ2d at 1452*" such that the method as now claimed is a statutory process claim. "*What is determinative is not how the computer performs the process, but what the computer does to achieve a practical*

application. See Arrhythmia, 958 F.2d at 1057, 22 USPQ2d at 1036." MPEP 2106 (IV)(b)(ii) Computer-Related Processes Limited to a Practical Application in the Technological Arts.

Regarding the 101 rejection against claims 8-14, Applicants will respectfully point out the term "software system" was amended into "software" in the preliminary amendment filed concurrently with the Petition to Make Special dated December 2, 2005.

As indicated, the claims are being amended as required by the Examiner. Accordingly, the withdrawal of the outstanding informality rejections is in order, and is therefore respectfully solicited.

Prior Art Rejections

Claims 1, 2, 8-9 and 15-16 were rejected under 35 U.S.C. §102(e) as being anticipated by US Patent No. 5,555,371 to Duyanovich et al. (hereinafter "Duyanovich"), and claims 3-7, 10-14 and 17-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Duyanovich in view of US Patent No. 6,938,045 to Li et al. (hereinafter "Li"). The references listed in the Form PTO-892 but not relied upon were cited as being pertinent to the disclosure of the invention. The above rejections have been carefully considered, but are most respectfully traversed as follows.

In a system including a plurality of primary storage subsystems 102 #1, 102 #2 and a plurality of secondary storage subsystems 102 #3, 102 #4, 102 #5 that are connected to each other via a network, the method for remotely copying data from each of a plurality of primary volumes 110 to a corresponding secondary volume of a plurality of secondary volumes 117 of the invention (for example, the embodiment depicted in Figs. 1, 3, 5; [0056]-[0063]), as recited now in claim 1, the primary volumes 110-1, 110-2, 110-3 are constituted by the primary storage subsystems 102 #1, 102 #2, and the secondary volumes 117-1, 117-2, 117-3 are constituted by the secondary storage subsystems 102 #3, 102 #4, 102 #5 (i.e., the consistency group C1 in Fig. 3). The method comprises the steps of: receiving, at each of the secondary storage subsystems 102 #3, 102 #4, 102 #5, remote copy requests (e.g., io-10 (T0), io-11 (T3), io-12 (T4), io-13 (T6), io-14 (T7) in 102 #3 in Fig. 5A) each of which is associated with a timestamp (e.g., T0, T3, T4, T6, T7) from each one of the plurality of primary storage subsystems 102 #1, 102 #2; receiving periodically (*"Each [primary] logical volume periodically issues a synchronize request 107 addressed to either all secondary logical volumes in the same consistency group or all secondary storage subsystems in the same consistency group."*[0033]), at each of the secondary storage subsystems 102 #3, 102 #4, 102 #5, synchronizing requests 107 (e.g., SYNC-C1-#1-T7 in Fig. 5B) each of which is associated

8

with a timestamp T7 <u>and a primary storage ID #1 of a primary storage subsystem 102 #1,</u> <u>which sends a respective synchronizing request,</u> from said each one of the primary storage subsystems 102 #1, 102 #2 respectively ([0063]); determining, at each of the secondary storage subsystems 102 #3, 102 #4, 102 #5, a first time as a first time parameter T5 based on the timestamp T7 included in the sync request 107; and <u>determining, at each of the secondary</u> <u>storage subsystems 102 #3, 102 #4, 102 #5, which remote copy requests (e.g., io-10 (T0), io-</u> <u>11 (T3), io-12 (T4), io-13 (T6), io-14 (T7) in 102 #3) to process ([0063]) based on the first</u> <u>time parameter T7, primary storage IDs (e.g., "#1") and timestamps (e.g., T0, T3, T4, T6, T7)</u> <u>associated with the remote copy requests, thereby maintain data I/O consistency among said</u> <u>storage subsystems</u> ([0007]).

The invention provides a unique remote-copy-request discriminative processing scheme in an N:M configuration ([0007]) of "*n primary storage subsystems and m secondary storage subsystems*" ([0004]) to maintain IO consistency in the consistency group.

For example, if the retrieved timestamp T7 is greater than the corresponding time parameter 111-1 #1 T3, an update occurs (As T7 > T3, the time parameter 111-1 #1 is updated from "T3" in the 102 #1 box in Fig. 5A to "T7" in the 102 #1 box in Fig. 5B). This update makes the time parameter 111-1 #1 T7 greater than the time parameter 111-1 #2 T5 in Fig. 5B, so that time parameter 112-1 is updated from "T3" in the 102 #1 box in Fig. 5A to "T5" in the 102 #1 box in Fig. 5B. When the time parameter 112-1 is updated, since the timestamp (T4) associated with io-12 is smaller than the timestamp (T5) that time parameter 112-1 indicates, only io-12 (T4) *(but not io-13 (T6), io-14 (T7),* is moved to the disk request queue 116-1. As another example shown in Figs. 7A-C ([0074]), T3, T5 are determined to be the synchronized times for the secondary storage subsystems 102 #3-5. These changes cause the time parameters 112-2 and 112-3 to be updated to T3 such that io-23 (T2) and io-31 (T2) are moved to the disk request queues 116-2 and 116-3, respectively.

The invention recited in claim 8 is directed to software for remotely copying data from a plurality of primary volumes to a plurality of secondary volumes comprising a module for determining, at each of the secondary storage subsystems, which remote copy requests to process based on first time parameter and timestamps associated with the remote copy requests.

The invention recited in claim 15 is directed to a system for remotely copying data from each of a plurality of primary volumes to a plurality of secondary volumes comprising means for determining, at each of the secondary storage subsystems, which remote copy

requests to process based on the first time parameter and timestamps associated with the remote copy requests.

Applicants respectfully contend that none of the cited prior art references teaches or suggests such a "remote-copy-request discriminative processing scheme in an N:M configuration of *n primary storage subsystems and m secondary storage subsystems* to maintain IO consistency in the consistency group" as the invention.

In contrast, Duyanovich only discloses a data copy technology from ONE primary data processing system 1 to ONE secondary data processing system 2 (Fig. 2), i.e., 1:1, rather than any N:M configuration between a plurality of (n) primary storage systems and a plurality of (m) secondary storage systems as the invention.

Duyanovich simply does not related to keeping the consistency of remote copies in the N:M configuration by setting each of secondary storage subsystems periodically to receive synchronizing requests "from the plurality of primary storage systems" respectively, while each synchronizing request including a timestamp T7 and "a primary storage ID" (such as 102 #1) and being managed based upon the time parameters 111, 112 in Fig. 5. Duyanovich neither disclose the unique updating processes of time parameter 111 and time parameter 112 which are different from each other as shown in the example. Rather than selectively/ discriminatively updating the time parameters according to SOME remote copy requests, Duyanovich uniformly updates ALL requested to be updated data in the secondary system (col. 6, lines 49-50).

Li was relied upon by the examiner to teach second time parameters and the relevant updating processing. However, Li merely support a 1:1 (rather than N:M) computer system architecture for synchronizing two remote, and independent, computer servers intended for maintaining duplicates of each other's files (col. 1, lines 10-13). Therefore, Li fails to compensate for Duyanovich's deficiencies.

Applicants contend that Chandler fails to teach or disclose each and every feature of the present invention as recited in independent claims 1, 8 and 15. As such, the present invention as now claimed is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.
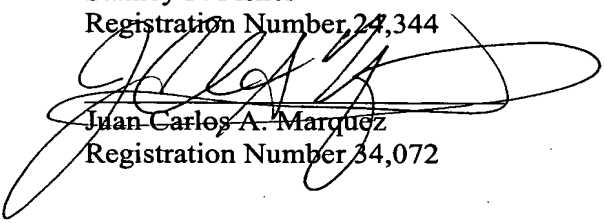

Conclusion

In view of all the above, Applicants respectfully submit that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art

references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and telephone number indicated below.

Respectfully submitted,

Stanley P. Fisher
Registration Number 24,344

Juan Carlos A. Marquez
Registration Number 34,072

REED SMITH LLP
3110 Fairview Park Drive, Suite 1400
Falls Church, Virginia 22042
(703) 641-4200

April 24, 2006

SPF/JCM/JT